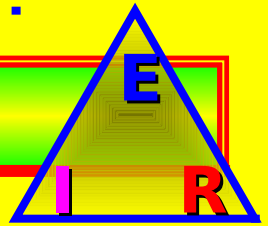
DC: w

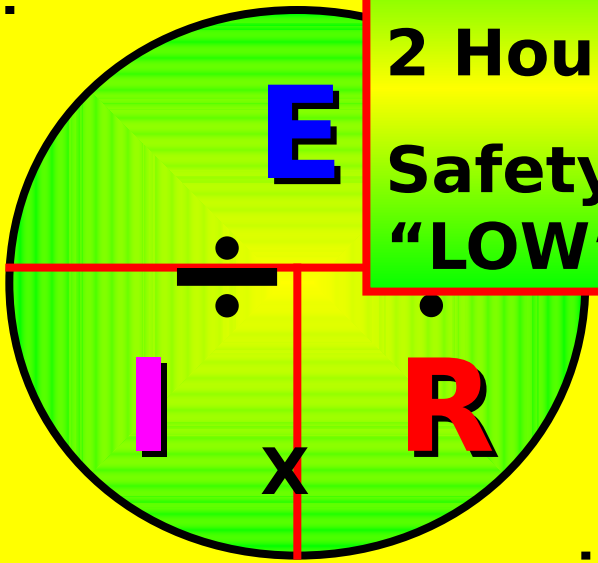


OHMS LAW

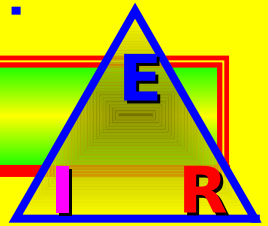
Unclassified:

2 Hour Conference, W/ 1Hr. PE3

Safety & Environmental Impact; “LOW”.



DC: Ohms Law



Terminal Learning Objective

ACTION:

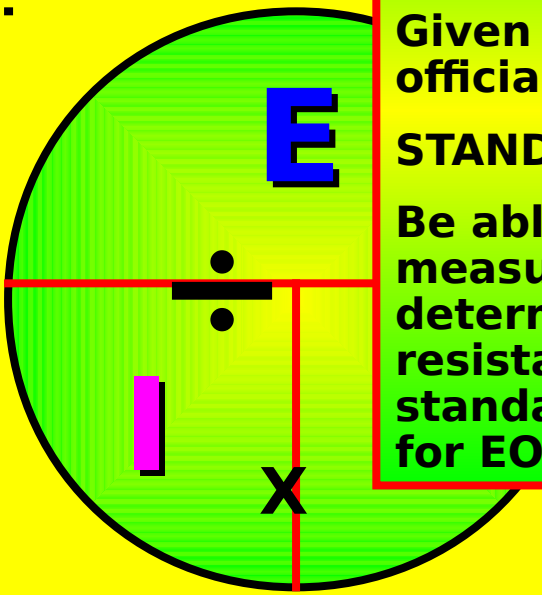
Calculate electronic units of measure for voltage, current, and resistance using Ohm's Law.

CONDITION:

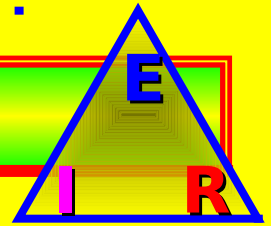
Given a classroom environment, calculator, and official OMEMS reference materials.

STANDARD:

Be able to identify electronic symbols and units of measure for voltage, current, and resistance and determine an unknown value of voltage, current, and resistance using Ohm's Law to the established standard of 7 correct answers out of 10 & 8 out of 10 for EOD.



DC: Ohms Law

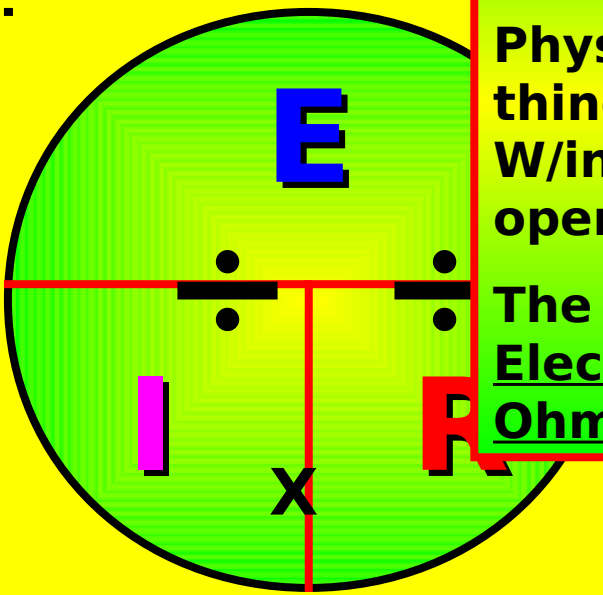


Introduction

Georg Simon Ohm a German Physicist, Defined the law that dictates the relationship between Voltage, Current and Resistance.

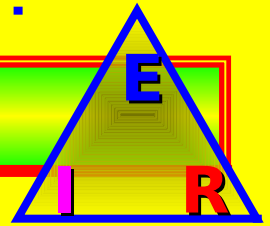
Physical Laws define the existence of all things. Quite simply, all things exist W/in the confines of very specific operating parameters.

The Applied Physics we know as Electronics, most fundamental law is Ohms Law.



Voltage

DC: Ohms Law



Voltage: Electromotive Force, EMF,

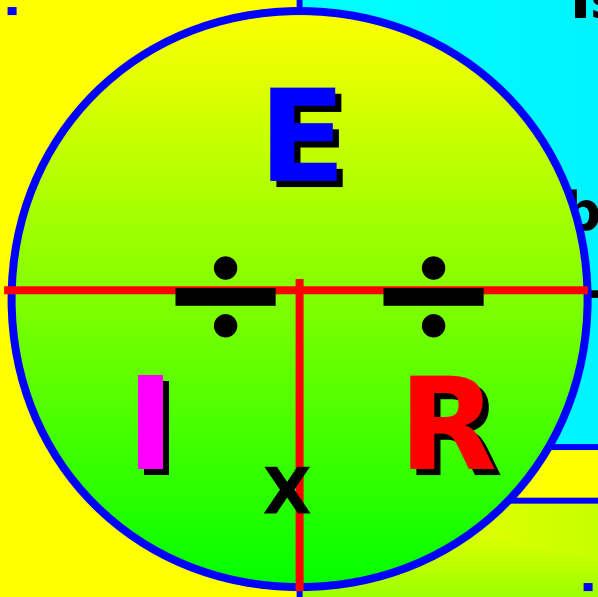
Is a Difference in Potential

{ or force }

between two points + & -

That causes electrons to move

or flow in a conductor

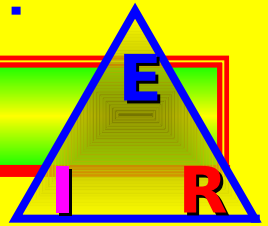


Symbol: E

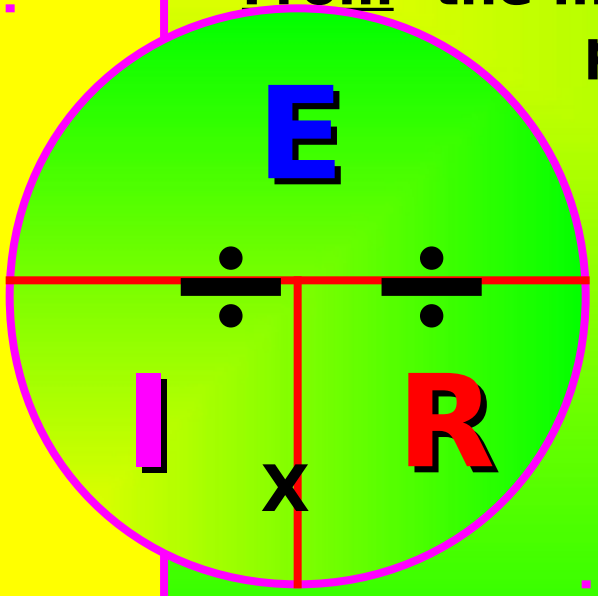
Unit of measure: Volts or V

Current

DC: Ohms Law



CURRENT: Is the **MOVEMENT OF ELECTRONS** From the most **Negative**, to the most **Positive** point in the circuit.



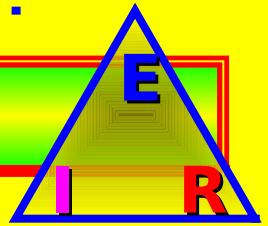
Symbol: I

Measured in units of: Amperes, {Amps}

A

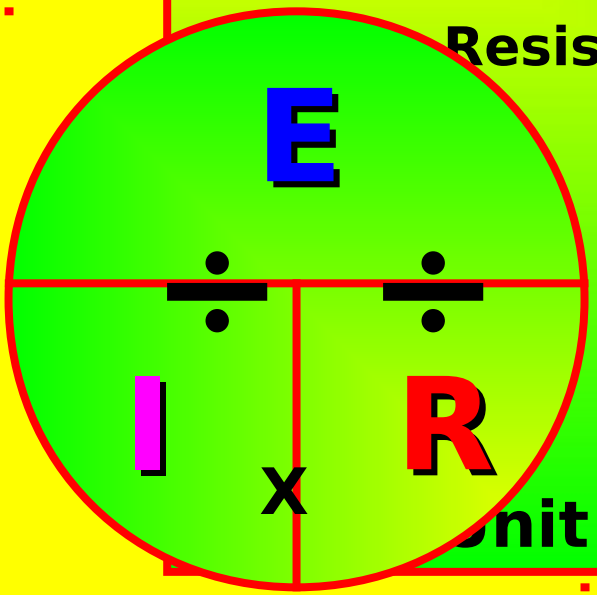
Resistance

DC: Ohms Law



Resistance: Is the <u>opposition to the flow of current</u>.

Resistance controls the flow of current.

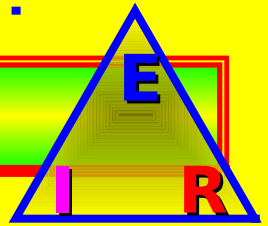


Symbol: R

Unit of Measure: Ohms, Ω [K Ω]

Calculate E

DC: Ohms Law

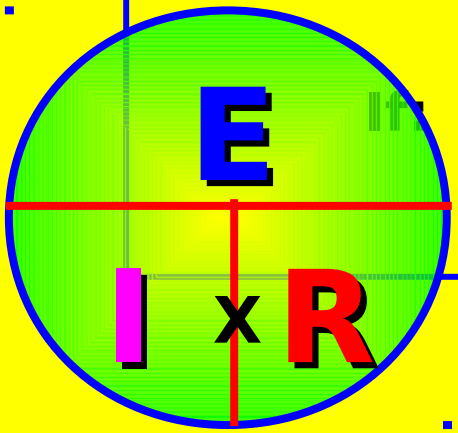


With Ohms Law we Can find any unknown, of Voltage, Current, & Resistance, Provided there are at least two known entities.

Voltage: Is a product of Current & Resistance.The Mathematical expression to calculate Voltage is;

I X R = E

Current total, Times, Resistance total = Voltage Applied

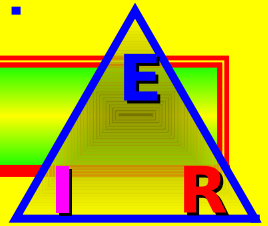


If I_T = 4 A, R_T = 3Ω then E_A = 12V

4A X 3 Ω = 12V

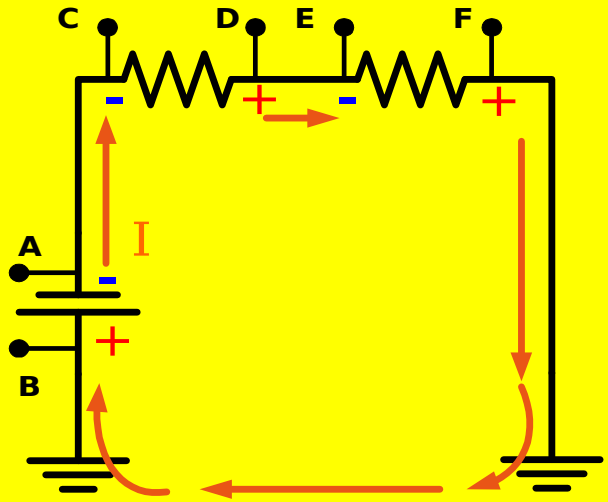
Voltage Drop

DC: Ohms Law



VOLTAGE DROP:

As current flows, it enters a resistor – , and leaves that same resistor + in respect to the point of entry.



This difference in potential felt across the resistor [s] is called the VOLTAGE DROP [s] .

Or

As current flows, the resistor develops a VOLTAGE DROP.

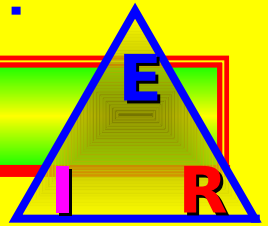
Symbol; $E_{R\#}$

Each resistor will have its own voltage drop and would be labeled,

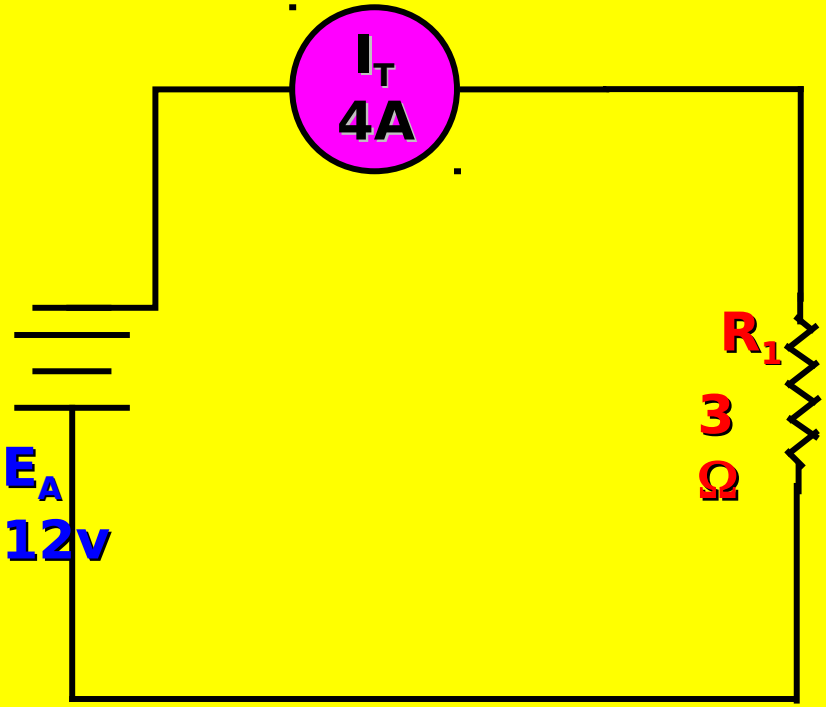
E_{R1} , E_{R2} , E_{R3} , E_{R}...

Calculate ER Ckt

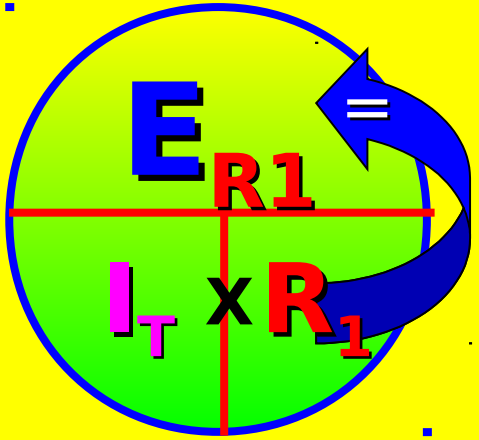
DC: Ohms Law

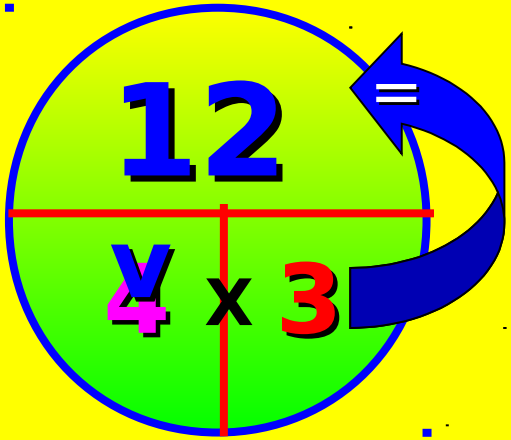


Calculating Voltage Drops:



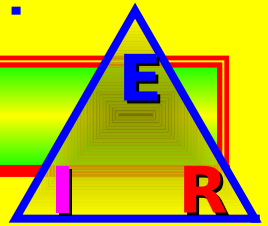
$E_{R1} = 12\ V$



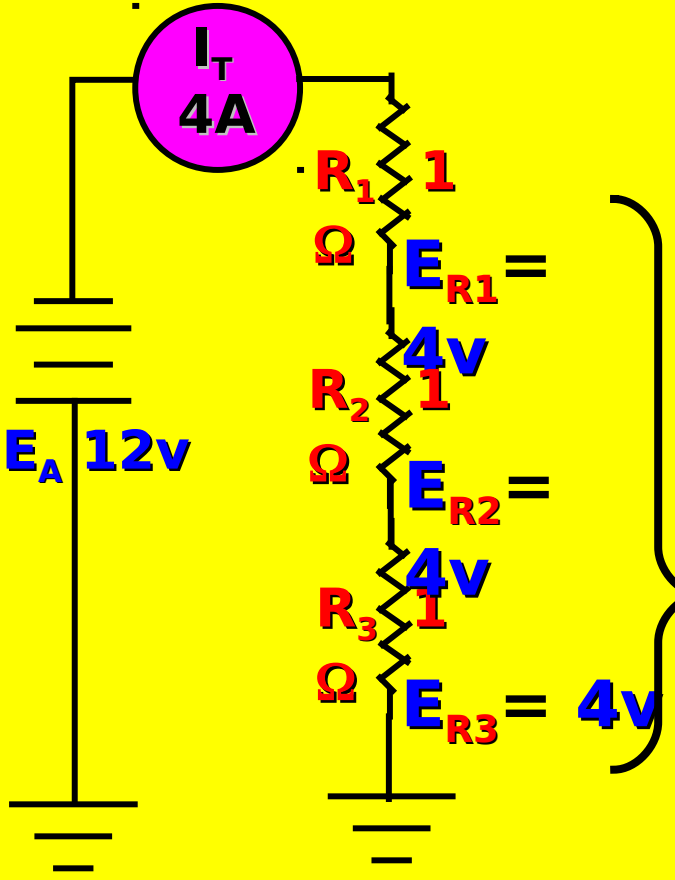


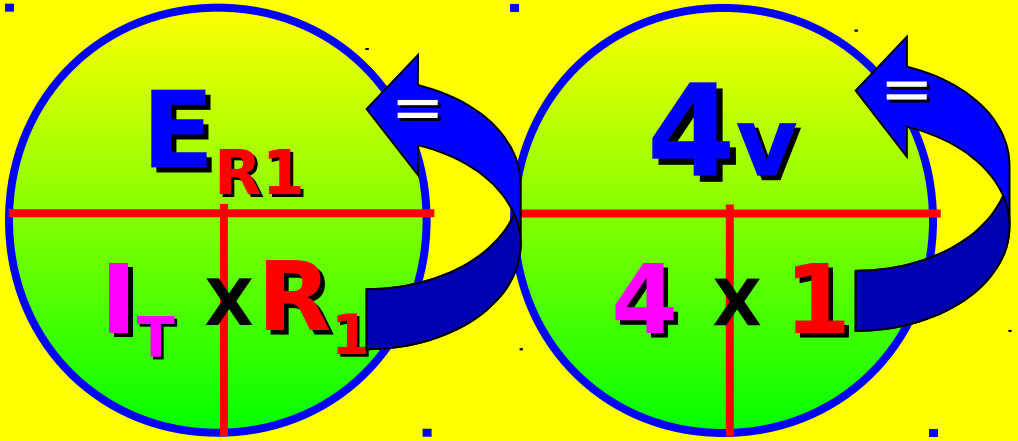
3 Resistors

DC: Ohms Law



Calculating Voltage Drops:





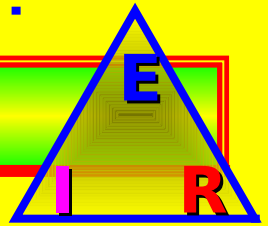
$E_{R1} + E_{R2} + E_{R3} = 12v$

The sum of the individual voltage drops of the resistors = E_A.

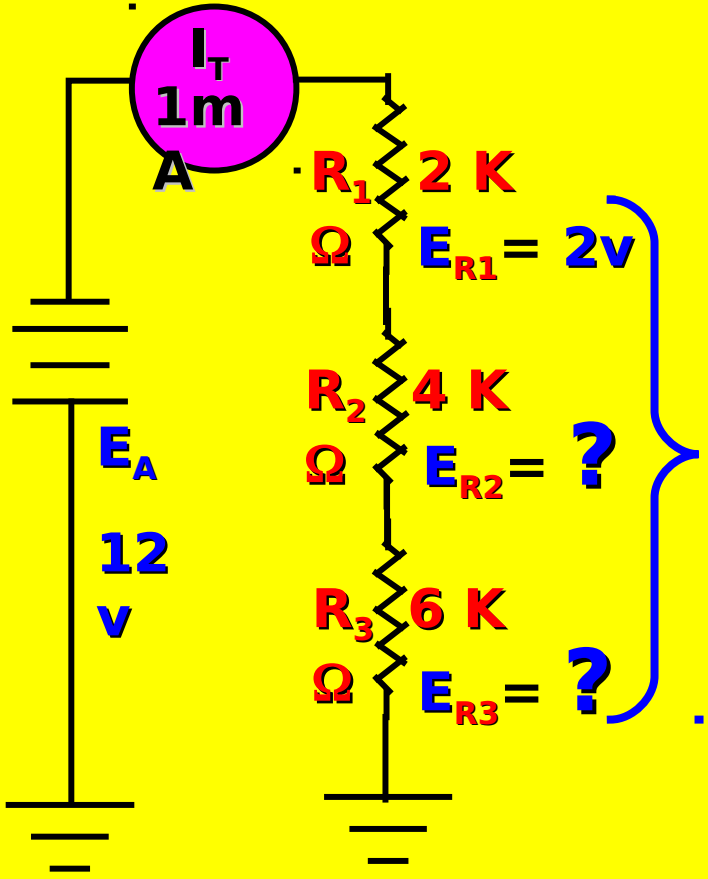
Kirchhoff's Law for Voltage

Challenge

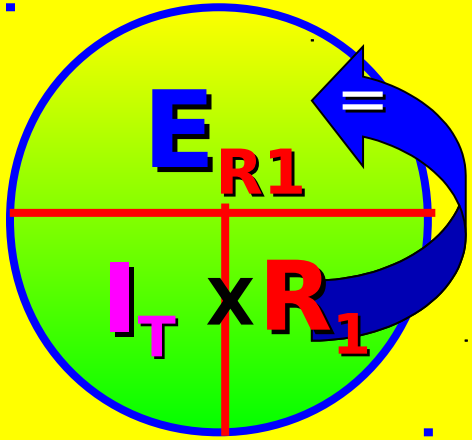
DC: Ohms Law

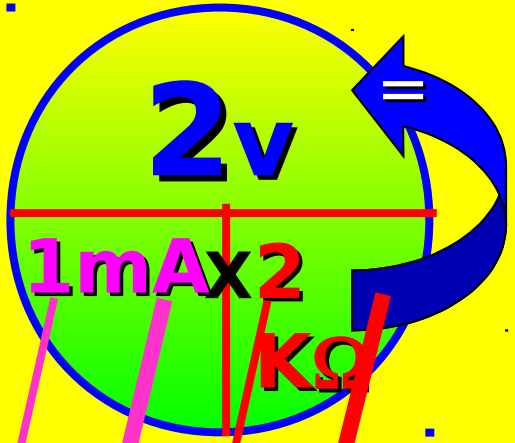


Calculating Voltage Drops:



$E_{R1} + E_{R2} + E_{R3} = 12v$

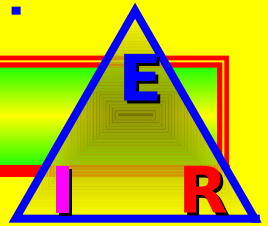




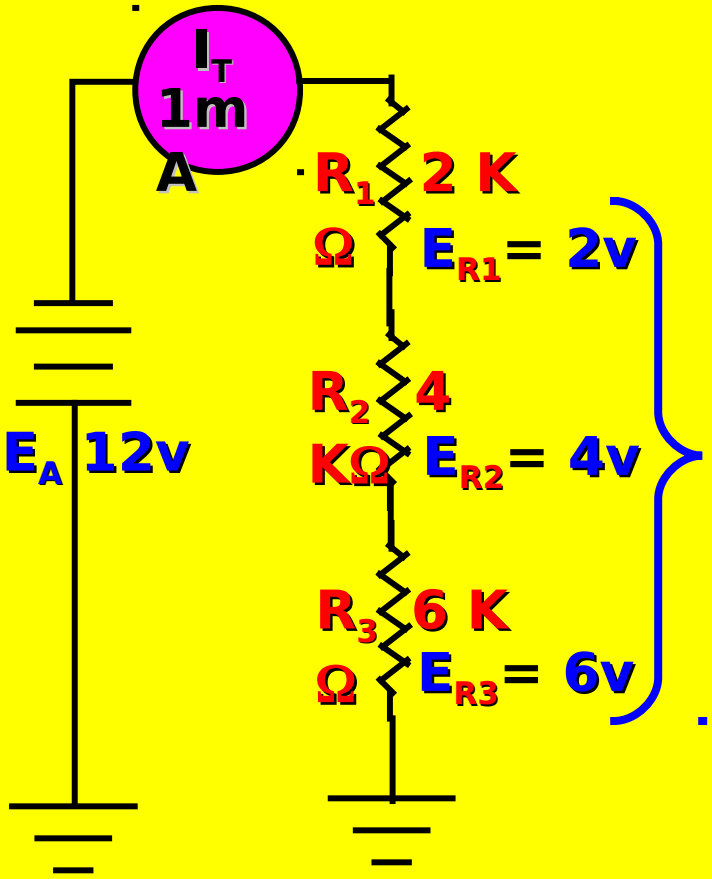
1 EE^{-3} X 2 EE^{3} = 2v On the Calculator:

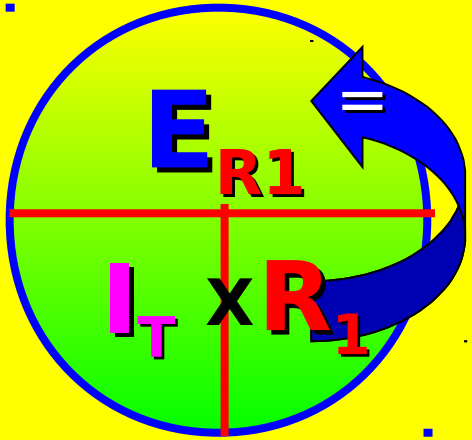
Answers

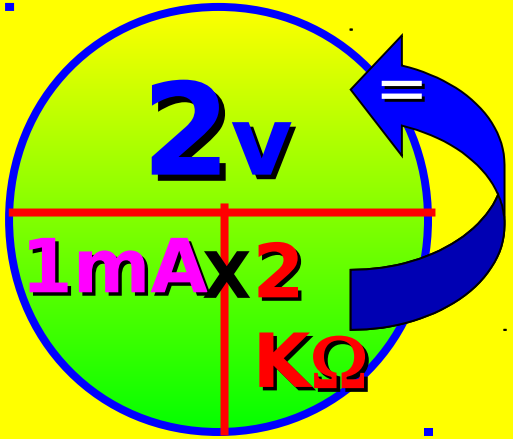
DC: Ohms Law



Calculating Voltage Drops:







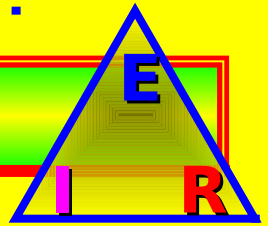
$E_{R1} + E_{R2} + E_{R3} = 12v$

Note:

The <u>Largest Resistor drops</u> the <u>most voltage</u> & the Smallest Resistor the least.

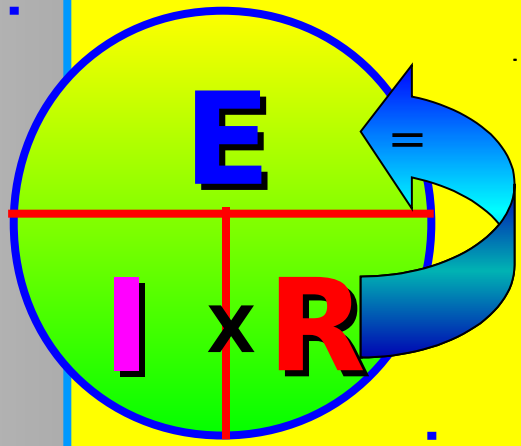
JOB: 1

DC: Ohms Law



JOB 1: Solve for Voltage in following. [NO Rounding]

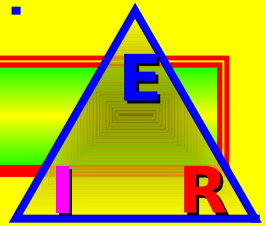
1.	2mA	10KΩ	____
2.	100mA	.5KΩ	____
		10KΩ	____
3.	10mA	30KΩ	____
4.	3mA	25Ω	____
5.	5A	2.5KΩ	____
6.	100mA	100KΩ	____
7.	2mA	30KΩ	____
8.	50mA	15KΩ	____
9.	2mA	25KΩ +50KΩ +25KΩ	____
10.	2mA		



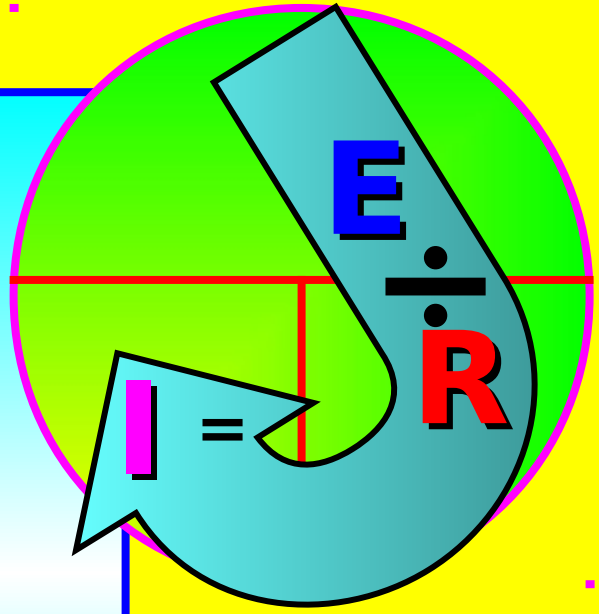
2 EE $^{-3}$ X 15 EE ^{3} = ?

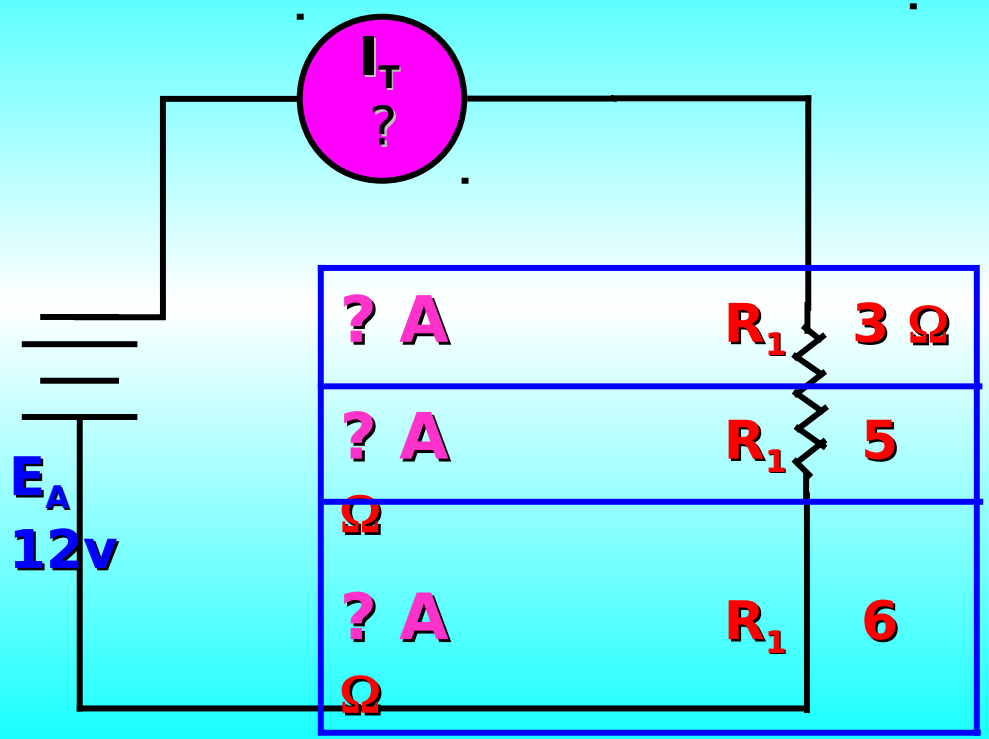
Answers

DC: Ohms Law



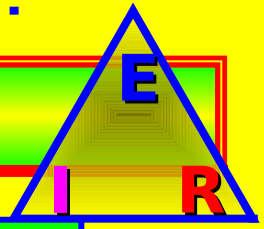
Calculating for Current; E ÷ R = I





Answers

DC: Ohms Law



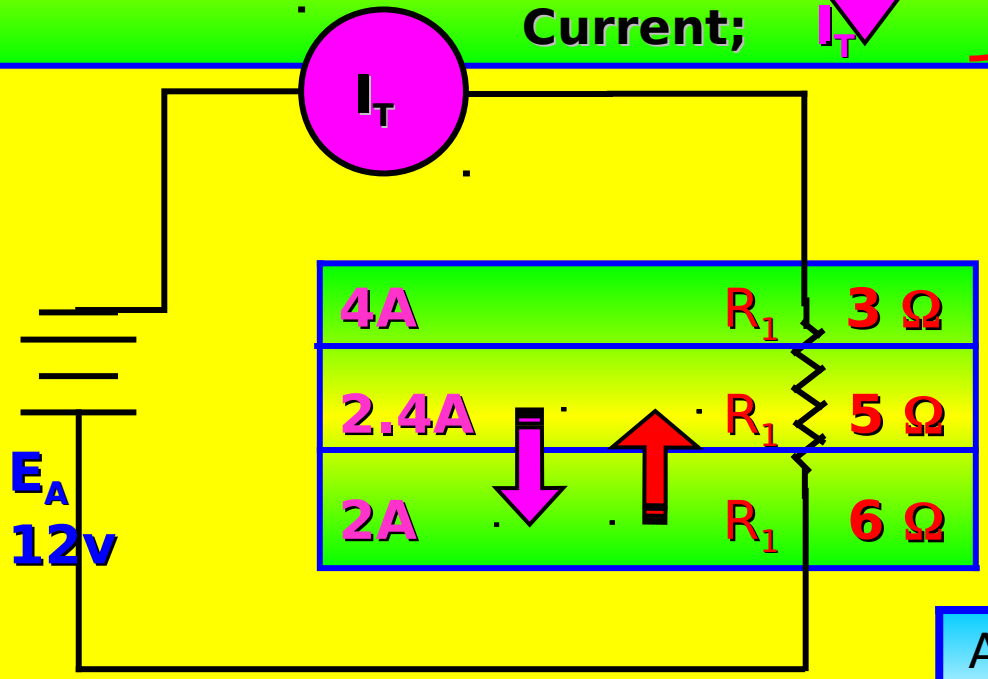
RELATIONSHIP:

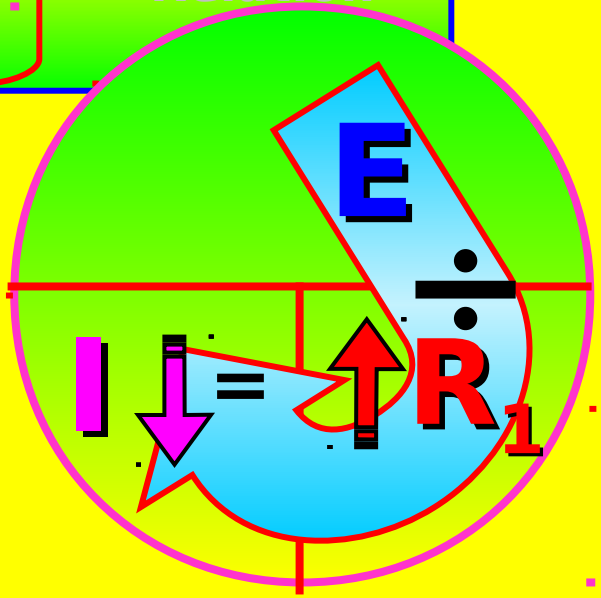
$R_{\#}$

Resistance; R_T or ↑

Current; I_T ↓

Inverse or opposite Relation

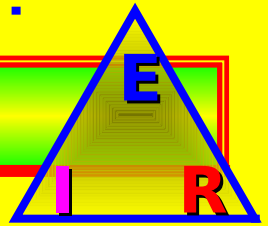




As Resistance Increases, Current decreased, Voltage held constant.

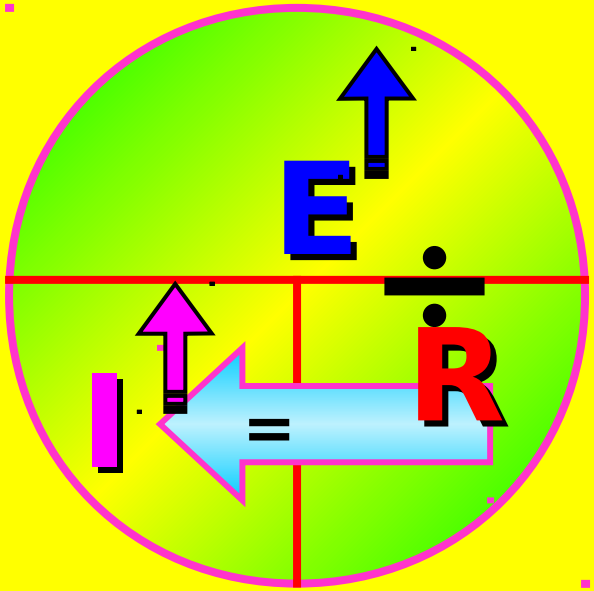
Relationship

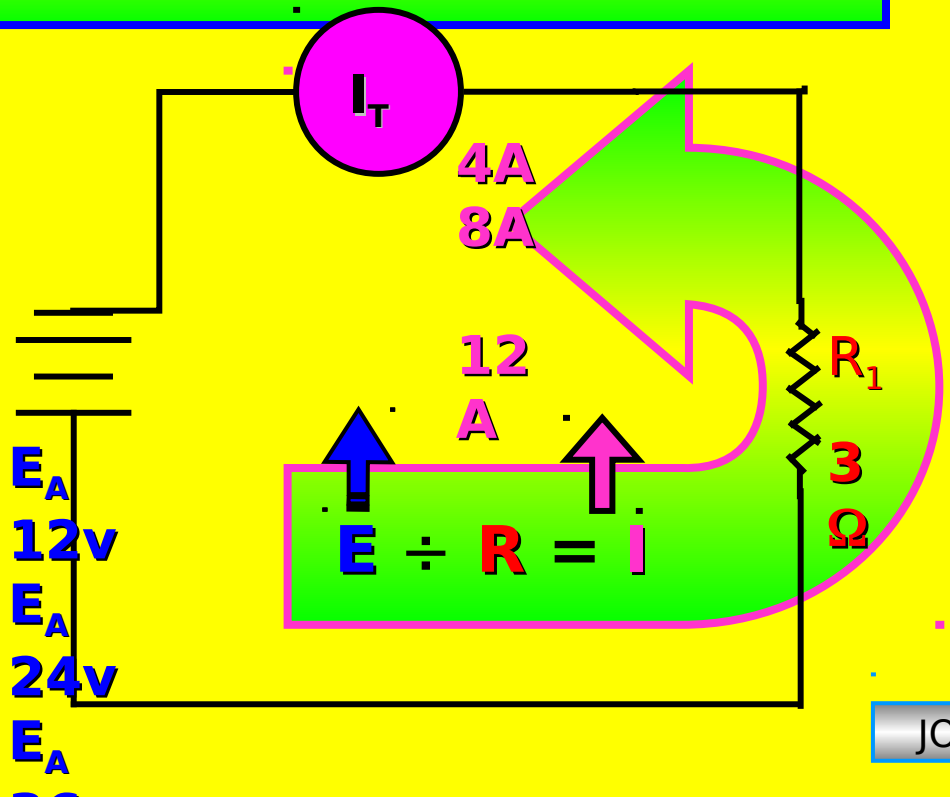
DC: Ohms Law



Direct Relationship

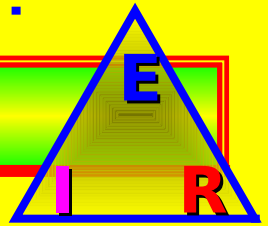
- **Voltage Applied;** E_A
- **Current Total;** I_T





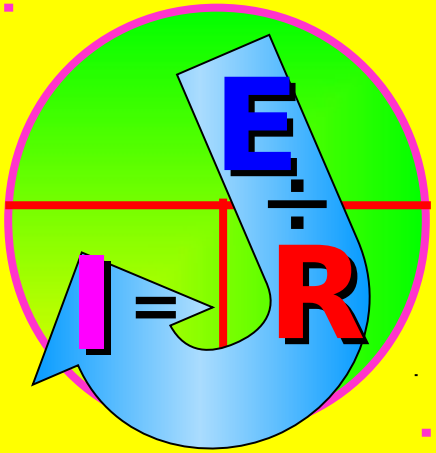
JOB: 2

DC: Ohms Law



JOB 2: Solve for Current in following. [NO Rounding]

1.	100v	25KΩ	____
2.	60v	120KΩ	____
3.	10v	60KΩ	____
4.	10v	5KΩ	____
5.	1000v	250KΩ	____
6.	24v	12KΩ	____
7.	48v	8KΩ	____ or ____
8.	20v	100Ω	____
9.	45v	15KΩ	____
10.	36v	6KΩ	____

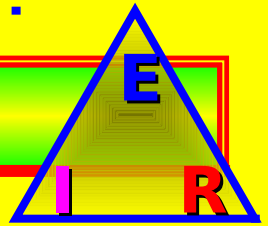


Note: If there is KΩ in the Resistance, Current will be in mA

* **45 ÷ 15 EE³ =.003A =?** *

Answers

DC: Ohms Law

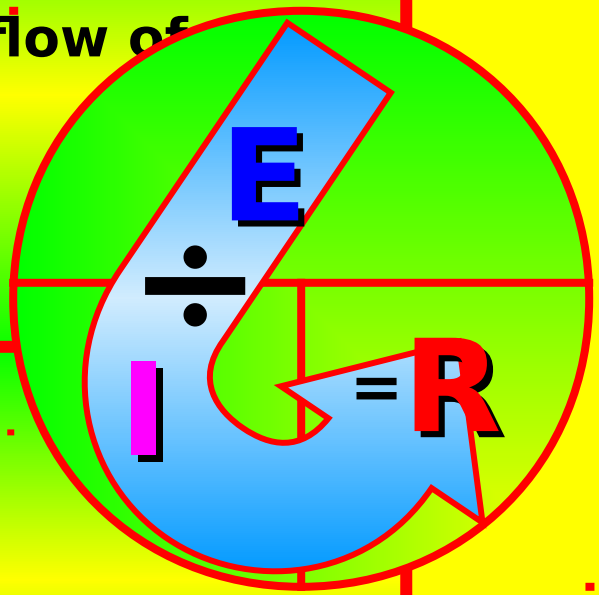


Resistance, is the **opposition to the flow of current**.

Resistance controls the flow of current.

Symbol: **R**

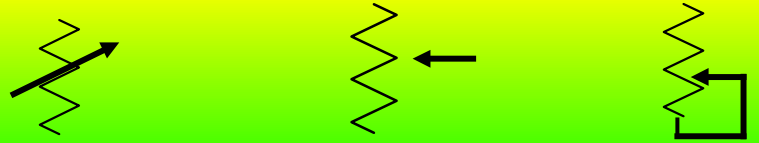
Unit of Measure: **Ohms**, **Ω**



2 Major Types of Resistors:

1. Fixed Value:

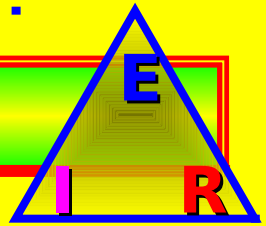
2. Variable:



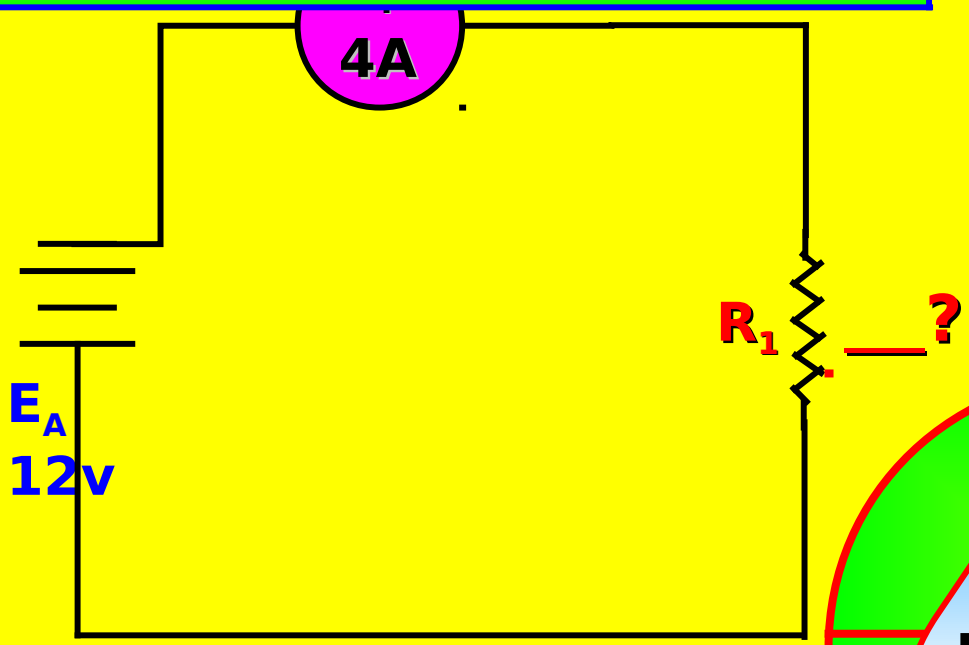
Common symbol Potentiometer Rheostat

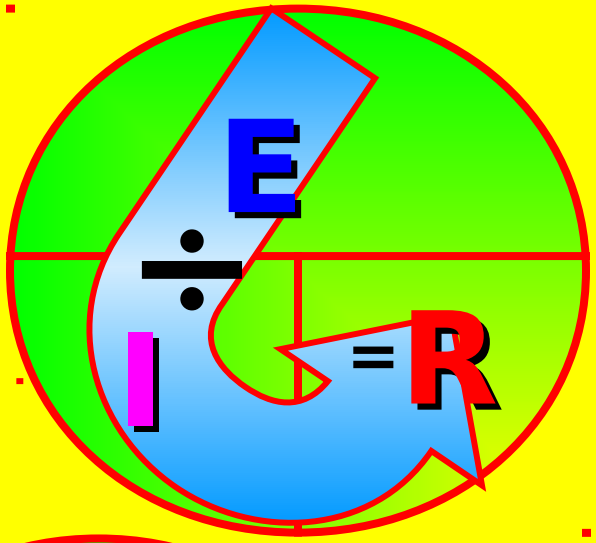
Calculating R

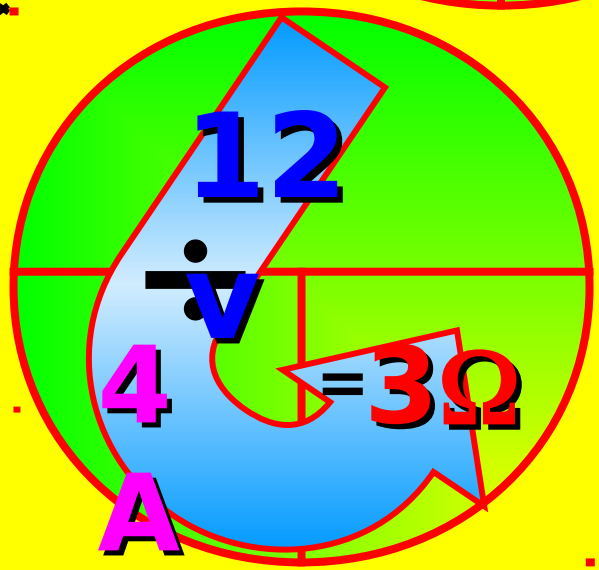
DC: Ohms Law



Calculating For Resistance; **E** ÷ **I** = **R**

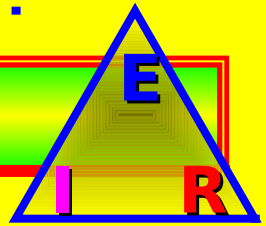






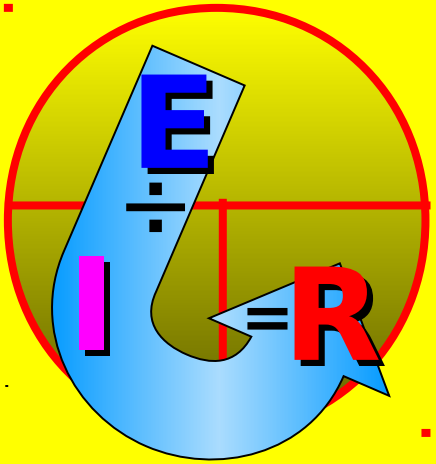
JOB: 3

DC: Ohms Law



JOB 3: Solve for Resistance in following. [NO Rounding]

1.	60v	5mA	_____
2.	250v	100mA	_____
3.	500v	2mA	_____
4.	300v	3mA	_____
5.	25v	1mA	_____
6.	50v	20mA	_____
7.	250v	50mA	_____
8.	250v	25mA	_____
9.	500v	10mA	_____
10.	1000v	2.5mA	_____

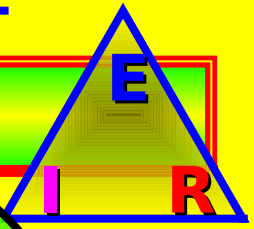


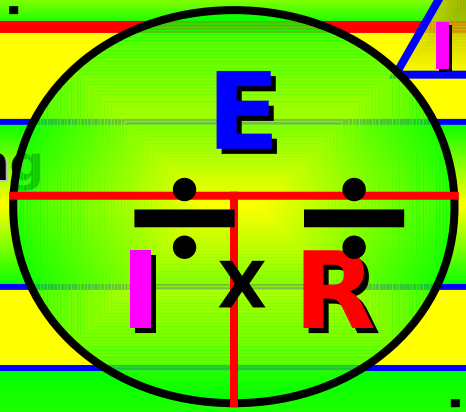
Note: **If there is mA of Current, Resistance will be in KΩ.**

* ***500 ÷ 10 EE^{-3} = 50,000. = ?**

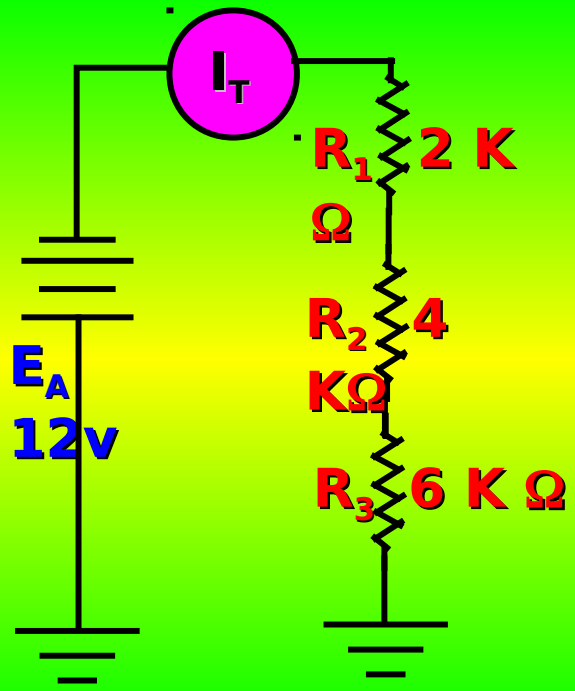
Answers

DC: Ohms Law





Ohms Law is used to find the operating parameters of a circuit [Ckt] .



$I_T \times R_T =$

$R_1 + R_2 + R_3 =$

$EA \div R_T =$

$I_T \times R_1 =$

$I_T \times R_2 =$

$I_T \times R_3 =$

$E_A =$ ___v

$R_T =$ ___ Ω

$I_T =$ ___ mA

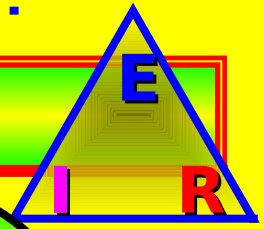
$E_{R1} =$ ___v

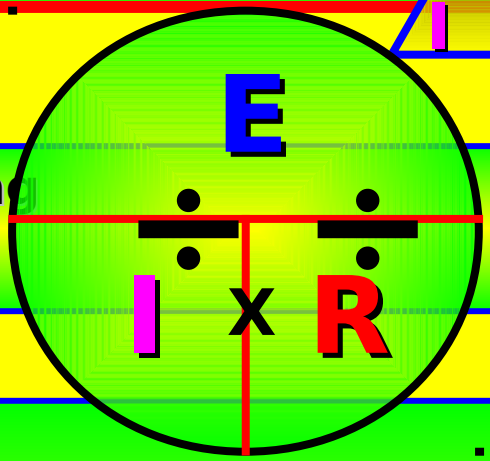
$E_{R2} =$ ___v

$E_{R3} =$ ___v

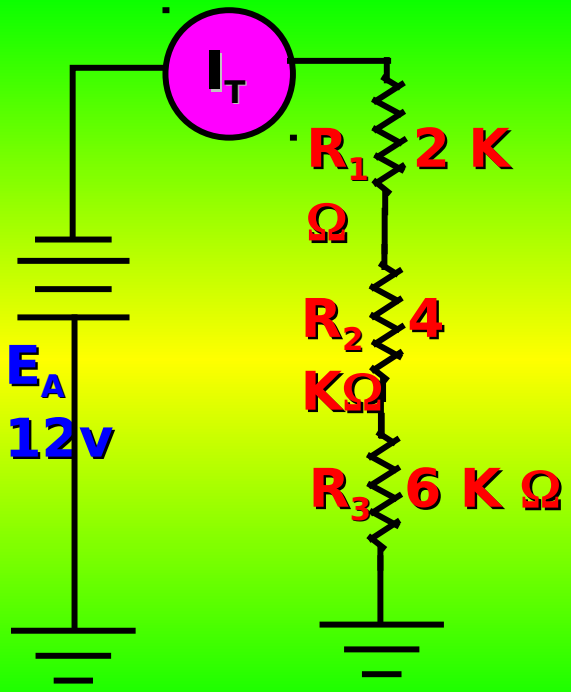
Answers

DC: Ohms Law





Ohms Law is used to find the operating parameters of a circuit [Ckt] .



$= I_T \times R_T =$

$R_1 + R_2 + R_3$

$=$

$EA \div R_T =$

$I_T \times R_1 =$

$I_T \times R_2 =$

$I_T \times R_3 =$

$E_A =$ 12v

$R_T =$ 12K Ω

$I_T =$ 1 mA

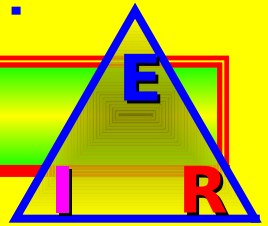
$E_{R1} =$ 2v

$E_{R2} =$ 4v

$E_{R3} =$ 6v

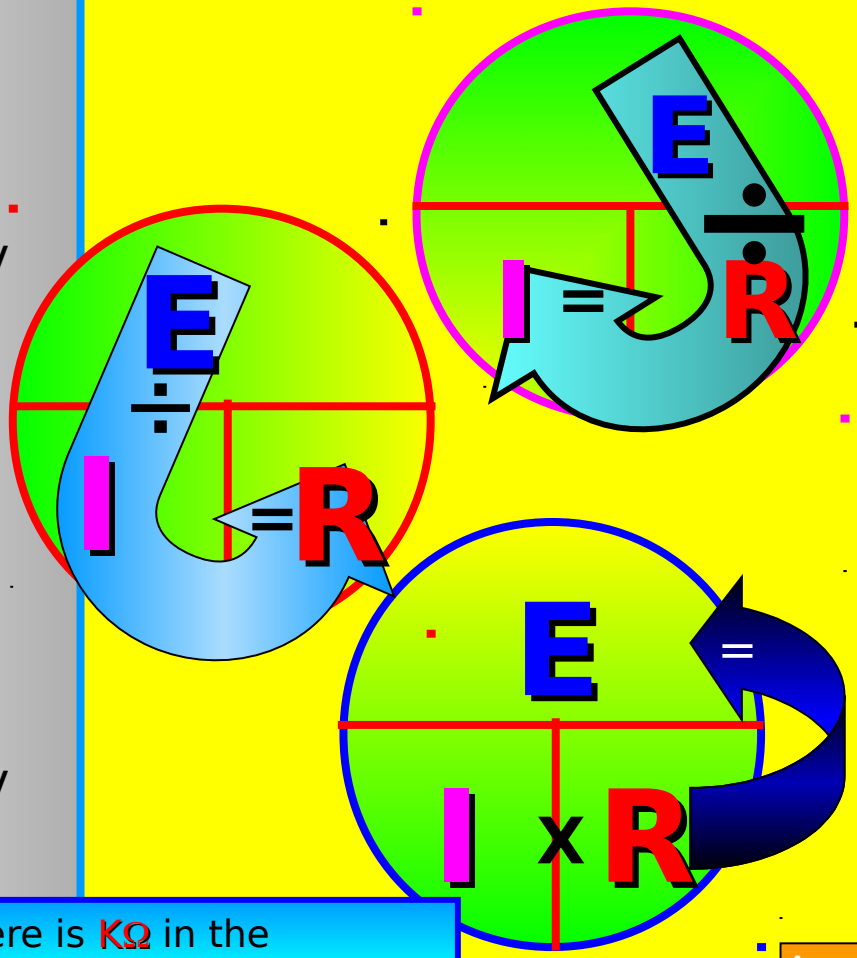
JOB: 4

DC: Ohms Law



JOB 4: Solve for required values in following. [NO Rounding]

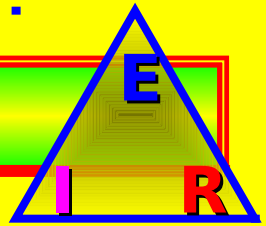
1.	____	100K Ω	30v
2.	5mA	75K Ω	____
3.	20A	____	115v
4.	50mA	8K Ω	____
5.	3mA	____	48v
6.	____	60K Ω	10v
7.	4mA	____	88v
8.	7mA	910K Ω	____
9.	12.5mA	____	150v
10.	____	800K Ω	64v



Note: If there is KΩ in the Resistance, Current will be in mA. & Vise Versa

Answers

DC: Ohms Law



Lesson Test:

Standard: 10 Questions W/in 20 Minutes. 70% Minimum Accuracy. 80% for EOD.

Reference: Official OMEMS Training Aids.

M	$= X 10^{6}$	EE 6
K	$= X 10^{3}$	EE 3
Whole Unit	$= X 10^{0}$	
m	$= X 10^{-3}$	EE +/- 3
μ	$= X 10^{-6}$	EE +/- 6